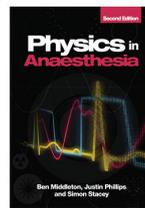


Chapter 19

Electromagnetism and alternating current



Self-assessment questions

These questions and answers, in both MTF and SBA formats, accompany *Physics in Anaesthesia 2e* and link back to the book for guidance.

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Multiple true / false questions

For each of the following questions, mark all answers as either true or false

1. Materials that can have a strong magnetism induced in them include:

- a. Cobalt
- b. Lithium
- c. Gold
- d. Diamagnetic materials
- e. Ferromagnetic materials

Did you know?

- Magnetic permeability (μ) is the measure of how easily a material can be magnetised.
- Diamagnetic and paramagnetic materials have constant relative permeabilities just below and above 1, respectively.
- The relative permeability of ferromagnetic material can increase up to 100 000 and more when an increase in magnetising field is applied.

2. Regarding the supply of electricity in UK hospitals:

- a. Alternating current is used because it allows transmission of very high currents
- b. The current travels from power stations at very high voltages
- c. Transformers step down the voltage to 120 V at substations before reaching hospitals
- d. Peak voltage supplied is 340 V
- e. Electricity is produced in power stations with high current and low voltages

Reminder

- Power is transmitted across long distances in the most economical way possible.

3. UK plugs have:

- a. A neutral wire to provide a path for errant currents to flow safely away
- b. A brown live wire
- c. A live wire which is the driving force for current
- d. An earth wire which is yellow with green stripes
- e. A neutral wire to complete the circuit by providing a return path for current

Did you know?

- The role of the fuse present in British Standard 1363 plugs is to act as a weak point in the circuit (see *Section 20.3*).
- The fuse will 'blow' if a device or extension lead tries to draw too much current, thus cutting off the electrical supply.

Single best answer questions

For each of the following questions, select the single best answer – note that more than one answer may be true but only one option represents the best answer

1. What best describes the effect of adding an iron core to a solenoid?

- a. It generates a stronger magnetic field
- b. It increases the magnetic flux
- c. The free electrons in the iron core align with the magnetic field generated by the current flowing through the solenoid, thus enhancing the strength of the magnetic field
- d. It increases the magnetic flux of the magnetic field generated
- e. The iron core generates a stronger magnetic field than the solenoid that is perpendicular to the solenoid's magnetic field and, overall, this increases the magnetic flux density

Did you know?

- The increase in field strength when an iron core is added is by a factor of around 10 000.

2. What is the difference between an electric motor and a dynamo?

- a. A dynamo has more turns of coil within its motor than an electric motor so that a higher voltage is produced when it is moved across a magnetic field
- b. A dynamo converts electrical energy into mechanical energy and an electric motor converts mechanical energy into electrical energy
- c. An electric motor converts electrical energy into mechanical energy and a dynamo converts mechanical energy into electrical energy

- d. A dynamo is used in power stations and an electric motor is used in wind turbines
- e. A dynamo converts mechanical energy into electrical energy with an alternating current

Did you know?

- Dynamos can only generate direct currents.
- Generators, or alternators, are needed for the alternating current.

3. If the ratio of the number of coils in the secondary coil of a transformer to the primary coil was 1:1000, what would the voltage across the secondary coil be if it is 400 000 V across the primary coil?

- a. The voltage would be higher and the induced current lower in the secondary coil
- b. The voltage would be lower and the induced current lower in the secondary coil
- c. The voltage would be 400 V
- d. The voltage would be 400 000 kV
- e. The voltage would be 240 V

Pointer

- See *Equation 19.4* and also think back to the cog analogy, as illustrated in *Figure 19.6*.

Answers to questions for Chapter 19 – Electromagnetism and alternating current

Multiple true / false questions

The following answers are true:

1. a and e
2. b, d and e
3. b, c, d and e

Single best answer questions

The options below represent the single best answer, although other options may also be true:

1. c
2. c
3. c